

Ridgway



Overview of the Wastewater Treatment Facility



Wetland serves as an aesthetic water feature for park entrance



An island is incorporated into the wetland design for habitat value



A cobbled pathway serves as an overflow structure to connect the wetland cells

Ridgway Facility Statistics

Nearest Town:	Ridgway
County:	Ouray
River Basin:	
Receiving Water Body:	Non-Discharging
Year Constructed:	1994
Population:	290
Elevation (feet):	6800
Design Flow (mgd):	.015
Average Flow (mgd):	
Size (acres):	

Facility Description

This wastewater treatment facility consists of a septic tank for primary sedimentation followed by an aeration cell. Effluent from the lagoon system is further treated in a surface flow constructed wetland system.

Lagoons

The Ridgway lagoon system is described in the table below. The cells are designed to operate in parallel or series.

Lagoon Information		
Cell No.:	1	2
Surface Area (sq. ft.)	5766	5766
Avg. Depth (ft)	10	10
Avg. Volume (Million gallons)	0.0375	0.0375
Detention time (days)	5	5
Aerator size (hp)	3	3

Background Information

Choosing a wetland system was based upon an extensive analysis of several alternatives. The seasonal operation of the park, combined with ideal climatic factors, affords an excellent opportunity to construct an evaporative system. It was also important that constructed wetlands can provide wildlife viewing areas.

Energy Analysis

Aerators in the lagoon system are the primary energy consumers at this facility.

Cost breakdown:

The costs estimated in a technical report¹ for this system are outlined below. These costs are based upon work by Urban Engineering and actual construction costs associated with the Horizon Nursing Home wetlands in Eckert, Colorado.

Concrete basins	\$30,000
Earthwork	\$30,000
Impervious liner	\$75,000
Controls / aerators	\$15,000
Wetland plantings	\$33,000
Engineering	\$15,000

¹ "Ridgway State Park Cow Creek Recreation Site Wastewater Treatment Technical Design Report" Colorado Division of Parks and Outdoor Recreation, Ridgway Design Office, Montrose, CO, March 25, 1992.

O&M:

The annual operational and maintenance costs, as estimated in the above mentioned technical report, are outlined below.

Labor (1/2 hr per day at \$20 per hour)	\$1,300
Electrical Power (aeration)	\$400
Replacement Parts (motors, controls, etc.)	\$500

Wetland Design

Design Methods

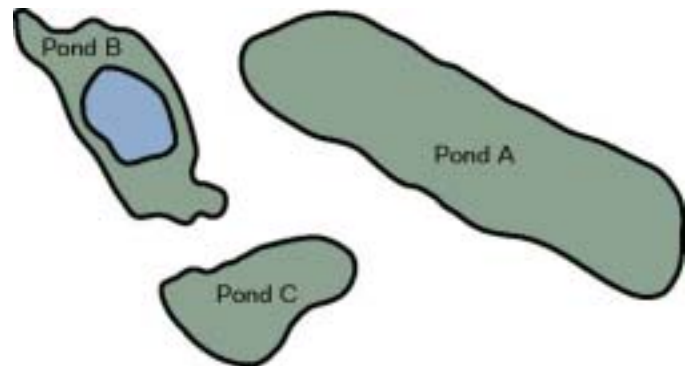
The wetlands were sized based upon estimated inflows, evaporation data, and organic loading parameters. The total annual discharge to the wetland is estimated to be 0.819 mgd. The design of the wetland involves two major components. The first involves the design and analysis of climatic data and evapotranspiration rates to properly size the wetland surface area. The second involves the design of the wetland to ensure that wetland capacity with regard to hydraulic and organic loading and oxygen transfer is not exceeded. The hydraulic loading rate chosen was 0.015 mgd/acre/day. The organic loading rate was chosen to have a seasonal average load of 5.7 lbs/acre/day, a peak month (August) of 9.7 lbs/acre/day and a peak day (assuming 15,000 gpd with 5 day retention and 50% BOD5 removal rate) of 35.5 lbs/acre/day.

Objectives

The primary consideration in designing the wetland system was to provide adequate removal of organic loading from the lagoon system. This system also included the aesthetic component in its design. The system is located at the park entrance, and it therefore highly visible. The shape and layout of the wetland cells are oriented to blend into the scenic surroundings.

Size

The wetland is configured with three ponds. Ponds A and B have a total surface area of 1.0 acre. These ponds are utilized as the primary containment and treatment area. Pond C is 0.5 acres and provides additional storage area, which is used during wet year conditions.



Shape

Since aesthetic value was a design objective, irregular borders and natural shapes were provided for this system. The schematic shows the general shape and relation of the three wetland ponds to each other.

Hydraulics

A gated pipe on the surface introduces wastewater from the lagoon to the wetland cells. There are 7 lateral pipes that distribute flow equally into the wetland system. Dam water can be used as an additive to keep the wetland from drying up. Batter boards are used to change water levels. Original boards were wooden, but muskrats destroyed. Subsequently the wooden boards were replaced with plastic boards. The piping configuration provides for independent diversion of water into each pond. The water is diverted through

gated irrigation pipe for even distribution into the ponds. Pond B contains a deeper water level to maintain an open area in the pond.

Treatment Goals

Permitted Discharge Limitations	
Oil and Grease:	10 mg/l (Daily Max)
CBOD ₅ :	25 mg/l (30-day ave)
BOD ₅ Removal:	85%
TSS:	105 mg/l (30-day ave)
PH, su (min – max)	6.5 – 9.0 (Daily Max)
Chlorine Residual:	0.5 mg/l (Daily Max)
Fecal Coliform Bacteria:	6,000 organisms per 100 ml (Daily Max)

Water Quality Data

This wastewater treatment facility operates under a groundwater permit. Since it is not discharging into a surface water, monthly discharge monitoring reports are not required. Water quality data is not available for this site.

General Ecological Setting

The park's vegetation communities include mixed conifer forests, piñon-juniper woodlands, mixed mountain shrublands, and western slope grasslands. Diverse wetland communities have become established around the reservoir and in the Uncompahgre River Valley above the reservoir and below the dam.

Cell Vegetation

The Ridgway State Park constructed wetland has three cells. Cell 1 (A) is about 0.6 acres and had about 15 percent open water and 85 percent vegetation cover in a single plant community. About 90 percent of the vegetation in the cell was cattail (*Typha latifolia*). Cell 2 (B) is about 0.3 acres with a small constructed island. About 70 percent of the vegetation cover in cell 2 (B) is duckweed (*Lemna minor*) and 30 percent is broadleaf cattail (*Typha latifolia*). Cell 3 (C) is 0.3 acres, has 15 percent open water and a single vegetation community dominated by broadleaf cattail (*Typha latifolia*), duckweed (*Lemna minor*), and reed canarygrass (*Phalaris arundinacea*).

Planting/Seeding

Cattail was planted in summer 1993 and amended with substrate pulled from existing wetlands nearby.

Weeds

Canada thistle (*Cirsium arvense*) occurs along the margins of cell 1 (A). Canada thistle is invasive and particularly troublesome in riparian and other wet areas in the intermountain west. Canada thistle threatens natural communities by directly competing with and displacing native vegetation, decreasing species

diversity, and changing the structure and composition of some habitats. Canada thistle spreads primarily by vegetative means, and secondarily by seed.

Maintenance Issues

Mowing temporarily reduces aboveground biomass, but does not kill Canada thistle unless repeated monthly for up to 4 years. Mowing adjacent to the wetland is not practical due to the placement of large cobbles for aesthetic purposes.

Wildlife

The constructed wetland at Ridgway State Park incorporates several features beneficial to wildlife, especially waterfowl. The inclusion of areas designed as wildlife habitat within the Park's wetland system allows the project to serve as a small wildlife area and opens up the site for other uses in addition to wastewater treatment and disposal. The combination of cover, open water, and a small island provides a potential nesting site for waterfowl. However, spatial requirements of waterfowl (e.g., mallard) may limit the site to one nesting pair. Viewed in isolation, the vegetative structural diversity and wildlife habitat value of the constructed wetland are moderate. At the landscape level, the constructed wetland does not add significantly to wildlife habitat found within the Uncompahgre River Valley. The location of the complex adjacent to a park entrance road and maintenance facility may limit wildlife use to human commensal species (e.g., mule deer, raccoon, and skunk).

Wetland Biodiversity Functional Assessment

General wildlife habitat rated relatively high due in large part to the presence of open water and the island designed for waterfowl. Habitat diversity and uniqueness of the Ridgway State Park constructed wetland rated moderate and low. Total functional points were 56% of the total possible for this wetland, and it was rated a category III wetland.

Wetland Biodiversity Functional Assessment.		
Function and Value Variables	Functional Points (0.1 to 1)	Possible Points
General Wildlife Habitat	0.7 (mod.)	1
General Fish/Aquatic Habitat	0.0	1
Production Export/Food Chain Support	0.7 (mod.)	1
Habitat Diversity	0.2 (low)	1
Uniqueness	0.2 (low)	1
Total Points	2.8 (56%)	5
Wetland Category (I, II, III, or IV)	III	

Human Use

The trail to Dutch Charlie with access at the Enchanted Mesa Trailhead skirts the south end of the constructed wetlands. An interpretative sign at that location provides hikers with information on the function of the treatment wetlands. This wetland has high aesthetic value because it is located along a trail in a state park, with interesting visual features and because it has a healthy vegetation cover.

Overall Site Comments

This wetland functions effectively in treating wastewater and it also has a healthy vegetation cover. This site provides waterfowl and wildlife habitat, and the incorporation of an island and irregular borders into the treatment wetland design adds to the habitat and aesthetic values of this wetland.